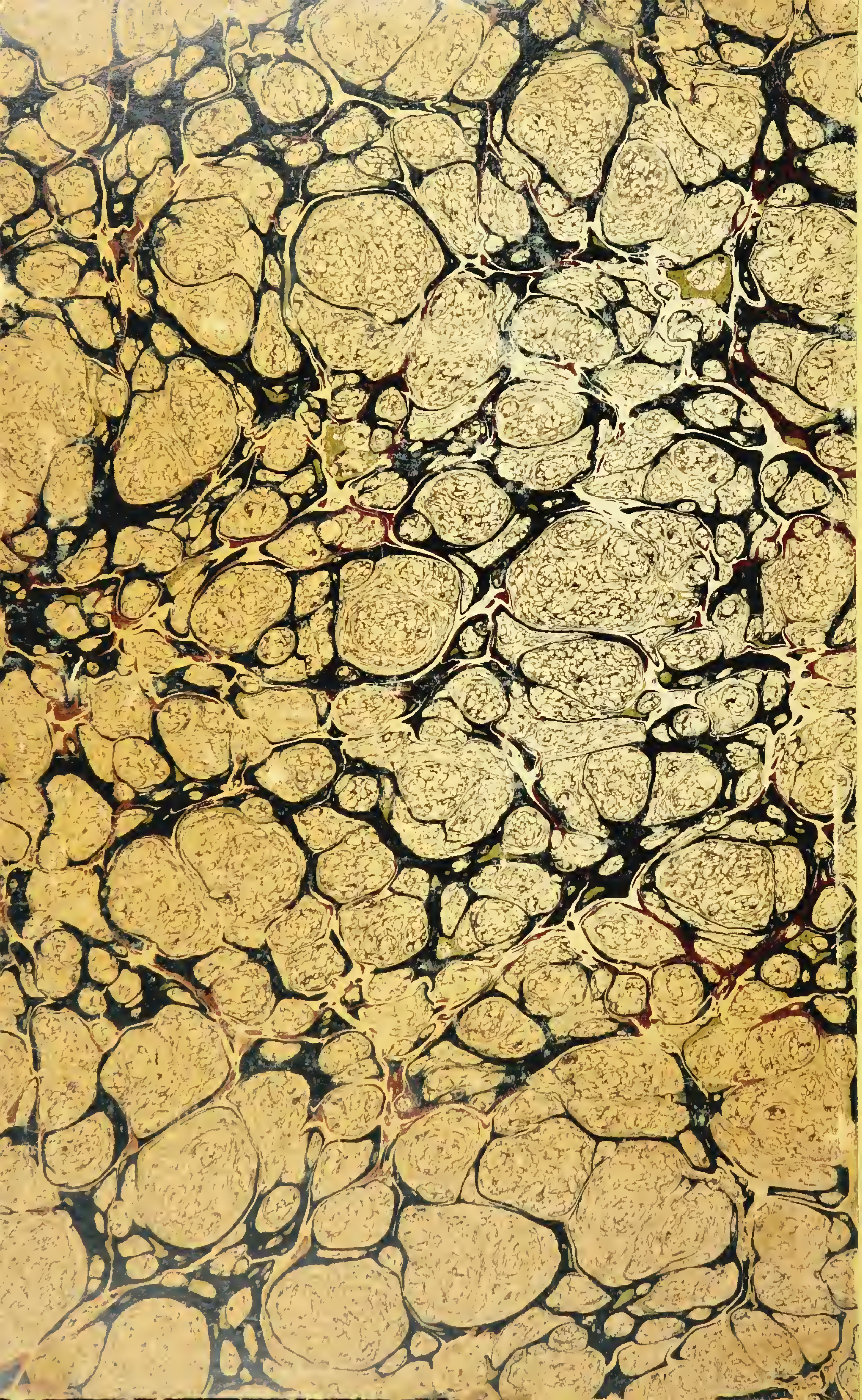

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FISH Physiology in Veterinary Education

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PHYSIOLOGY AS A FUNDAMENTAL IN VETERINARY EDUCATION[1]

EDUCATION, like nature, should be orderly—a development from the simple to the complex. The development of the morphologically simple cell into the complex adult animal organism proceeds in an orderly way. The cell is the morphological unit and the mature animal consists of innumerable units, some of which have undergone a very great modification as to form. The cell can not be accepted as the physiological unit. What is apparently simple as to form is not necessarily simple as to function. The activities of the cell are but partially understood. The physiological unit, around which center these activities, is, like the atom of chemistry, invisible, but its power is unquestioned. Function is concealed in structure. Function is not often revealed without search and, indeed, research. In some instances it may be so superficial as to be easily recognized; in others it may lie so deeply that the keenest intellect is baffled in demonstrating its presence in a satisfactory manner.

The relation of physiology to the biological sciences is most intimate. It is not a question of independence but of interdependence. Many more or less plausible arguments may be advanced that one particular science may have a greater relative value than others. Chemistry and physics are concerned with matter and we ordinarily associate them with unorganized bodies. Physiology is restricted to *living* matter, or organized bodies. We can not consider inorganic material in physiological terms. Yet chemistry and physics are intricately involved in physiological processes and the question arises, perhaps, in the minds of some if, under the proper combination of conditions and of environment, life is not evolved from chemical reactions. Chemical action is constantly occurring in living tissue. Does it control the living tissue or does the living tissue control it? In the processes of filtration, diffusion and osmosis, physics occupies a relationship scarcely less intimate than chemistry. Solutions of crystallizable substances of unequal concentration separated by an animal membrane will ultimately become uniform. Physics has demonstrated this. Is there any difference in the results if the animal membrane be living or dead? In some instances it has been shown that it does. Waymouth Reid introduced into the intestine of a living animal a certain amount of its own blood serum. The epithelial cells of the alimentary tract were therefore in contact on the one side with this blood serum and on the other with capillary vessels containing blood, the fluid of which had the same composition as the serum in the intestine. If the intestinal wall acted like an ordinary dead membrane there could be no passage of the serum from the intestine to the blood by diffusion or osmosis. It was found that the serum was rapidly absorbed. This could not be due important for the surgeon to know thoroughly the form and structure of the tissues in order that abnormal or diseased parts may be removed with the hope of bringing about a normal condition again; then is it equally important for the medical practitioner to know thoroughly the functions of the tissues and their system of cooperation, if he is to restore the diseased organism to its normal physiological standard. Therapeutics must be invoked with a knowledge of those agents which will stimulate the weakened parts to their normal tone, or which will soothe the overirritable or overexcited tissues to their natural calm. Without anatomy we may assume there could not be proper surgical procedure; we may equally assume that without physiology there could not be satisfactory medical practise. Indeed, the practitioner's service is but an extended laboratory course in physiology.

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[1] Presented at the meeting of the Association of Veterinary Faculties and Examining Boards of North America at Toronto, Canada, August, 1911.

Diseases are due to a disturbance of physiological cooperation either internally through the interrelationship of the different tissues or externally from the introduction of material foreign to the organism. In veterinary practise there is perhaps no more striking example of disturbed cooperation than in azoturia. Why should renewed work after a day or two of idleness cause such a physiological upheaval in the horse as to make it necessary to record so large a percentage of fatalities? The answer will probably be found in the disturbed adjustment of the circulation, muscular and renal tissues, caused, perhaps, through chemical substances introduced through the digestive system and influenced more or less by external conditions. Why are other domesticated animals exempt from this affection? The hydrocephalic dummy, parturient paresis in cattle, and many other diseases when finally worked out may be found to be due to the production of some chemical substance developed in one tissue, which, circulating to other tissues, excites them directly or reflexly to such an extent that the whole adjustment is thrown into more or less disorder.

In the urine of man, more than a trace of indican is pathological. Why should the relatively large amount of this substance usually found in the urine of the horse be regarded as a normal condition?

In order to solve the problems of the normal as well as the abnormal, it would appear essential to work out the physiology of each species of the domesticated animal distinctly. While many of the conditions may be fundamental to all, there are some characters which are peculiar to each type. Physiology is not all internal; external conditions must be reckoned with. Diet, habit and environment all contribute to the harmonious adjustment of the internal mechanism.

The practitioner should not be blamed too severely for a certain amount of empiricism. Physiology has not yet solved all of its problems and until the solution is forthcoming a strictly rational treatment of all diseases is impossible.

If my meaning has been clearly expressed, it should be apparent that physiology is a *living* science and is concerned with the manifestations of life; its action is cooperative, not only to the tissues in an individual organism, but in a broader sense to the other biological sciences; it is fundamental especially to pathology and medicine, and, cooperating with them, seeks to conserve the general health of animals and man.

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